Math 2210 - Exam 3

University of Utah

Fall 2008

Name: _____

Instructor: Dylan Zwick

1. (20 points) *Multiple Integrals*
   Calculate the following integrals:

   (a) (3 points)

$$\int_0^{\pi} \int_0^1 x \sin y dx dy$$

   (b) (4 points)

$$\int_0^2 \int_{-x}^{x} e^{-x^2} dy dx$$

(c) (4 points)

$$\int\int_S \sqrt{4-x^2-y^2}dA$$

where S is the first quadrant sector of the circle $x^2 + y^2 = 4$ between $y = 0$ and $y = x$.

(d) (4 points)

$$\int_0^2 \int_1^z \int_0^{\sqrt{\frac{x}{z}}} 2xyzdydxdz$$

(e) (5 points)
Calculate the volume of the solid bounded by the cylinders $x^2 = y$ and $z^2 = y$ and the plane $y = 1$.

2. (8 points)

   Find the minimum distance between the origin and the surface:

$$x^2y - z^2 + 9 = 0.$$

3. (7 points)

   Evaluate:

$$\int_0^{\sqrt{3}} \int_0^1 \frac{8x}{(x^2+y^2+1)^2} dydx.$$

   Hint: Reverse the order of integration.

   Recall $\int \frac{1}{1+x^2} = \arctan x + C$

4. (8 points)

   Find the area of the surface that is the part of $z = 9 - x^2 - y^2$ above the plane $z = 5$. Make a sketch of the surface. (Probably best to make the sketch before calculating the surface area.)

5. (7 points)

   Write the iterated integral:

$$\int_0^2 \int_0^{4-2y} \int_0^{4-2y-z} f(x,y,z)dxdzdy$$

   as an integral with the order of integration $dzdydx$.